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(54) Digital time multiplexed mobile telephony system with an effective utilization of every time frame.

(57) A digital time multiplexed mobile telephony system including a fixed base station and a plurality of mobile stations. For established connections the mobile stations are assigned channels, each corresponding to a time slot, from a plurality of time slots included in a time frame. The channels are assigned such that the mobile station to which the propagation time is shortest is assigned time slot 1, the mobile station to which the propagation time is next shortest being assigned the time slot 2, and so on. After the last time slot in the time frame there follows a guard time common to all time slots, for avoiding that the transmissions of the mobile stations wholly or partially overlap each other at the base station receiver.

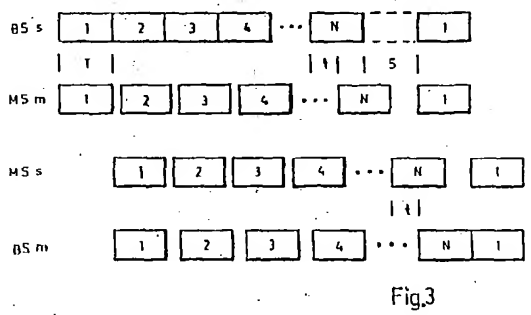

Fig.3

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tion and transmission in the mobile stations, mentioned hereinbefore, is exemplified in Figure 2.The same notations are used in the Figure as in Figure 1, and the same conditions with relation to the propagation times as with the example according to Figure 1 are assumed to exist. The transmission during time slot 2 from the base station is thus received after the propagation time t in the mobile station which is assigned this time slot. As will be seen from the row MSs, the mobile stations assigned the time slots 1 and 3 start their transmissions after a time delay F, which is equal to 2t, from the instant receiving has been terminated. On the other hand, the mobile station which has been assigned the time slot 2 starts its transmission without any time delay. As a consequence of this the transmissions from the mobile stations will be received at the base station without any overlapping.

An example of the distribution of the time slots in a mobile telephone system in accordance with the invention is illustrated in Figure 3. Similar denotations as in the previous figures are used in this Figure. The mobile stations are assigned time slots in such a way that the mobile station assigned time slot 1 is the one which for the moment has the shortest propagation time to the base station, i.e. the one which in practice is closest to the base station. The mobile station having the next shortest propagation time is assigned time slot 2, and so on. The last assigned time slot in the time frame is denoted N. After this follows a guard time S common to all time slots. The station assigned time slot 1 is assumed, as previously, to be so close to the base station that the propagation time is equal to zero. The propagation time to the mobile station which has been assigned the time slot N is denoted t and is assumed to be maximum and equal to half the guard time, i.e. S/2.

From the row MSm, mobile station reception, it will be seen that the mobile stations receive the transmissions from the base station with successively increasing delays from zero to $t=S/2$. In the illustrated example, each mobile station starts its transmission immediately after it has terminated its reception from the base station during the assigned time slot, which is apparent from the row MSs, mobile station transmission. However, it is also conceivable to allow each mobile station to start its transmission after an invariable time delay from the instant it has terminated its reception. In both cases the transmissions from the mobile stations will be received in the base station without overlapping. This applies under the condition that the maximum propagation time t does not exceed half the guard time, i.e. S/2. This is a result of the condition that the combined propagation time backwards and forwards between the base station and the mobile station to which the propagation time is greatest may not exceed the guard time S.

In the proposed telephony system there are, of course, means for assigning channels to the mobile stations. Similar to the system according to Figure 2 means are also included in the base station for measuring the propagation times between it and the mobile stations. In addition, means are included in the mobile telephony system for comparing these times with each other and assigning channels, i.e. time slots, to the mobile stations in response to the comparison results, according to the principle mentioned hereinbefore. In such a case, means for assigning channels are controlled, inter alia, by the means for comparing the propagation times with each other. However, the insertion of variable delays in the mobile stations, with associated control means in both base station and mobile stations is avoided.

Means for comparing the propagation times may be included in the base station or in the mobile station telephone exchange to which the base station is connected. This also applies to the means assigning channels to the mobile stations.

It should be emphasized that several base stations are associated to each service area, these base stations being connected to a single mobile telephone exchange (MTX). However, these base stations utilize different frequencies and all the time slots in a single frame are therefore tied to a single base station.

Should the internal order with relation to the propagation time be changed during established communications, due to the mobile stations moving, a change in channels is carried out with the aid of the means for this puspose already arranged in the mobile telephony system.The channel changes are thus carried out so that the mobile stations to which the propagation time is shortest is once again assigned the time slot 1, the mobile station to which the propagation time is next shortest is assigned the time slot 2, and so on.

Claims

1 Digital time multiplexed mobile telephony system including a fixed base station, a plurality of mobile stations, and means for assigning channels to the mobile stations, where, for an established connection, each mobile station is assigned a channel corresponding to one of a plurality of time slots included in a time frame, and where each time frame sent from the base station also includes a guard time for avoiding that the transmissions of the mobile stations completely or partially overlap each other at the base station receiver, characterized in that the base station includes means for measuring the propagation times to the mobile stations, in that the mobile telephony system also includes means for comparing the different propagation times with each other, and in that the channels are assigned in such a way that the mobile station to which the propagation time is shortest is assigned the first time slot in each time frame, the mobile station to which the propagation time is next shortest is assigned the second time slot in each time frame, and so on, and that a guard time follows after the last time slot in each time frame.

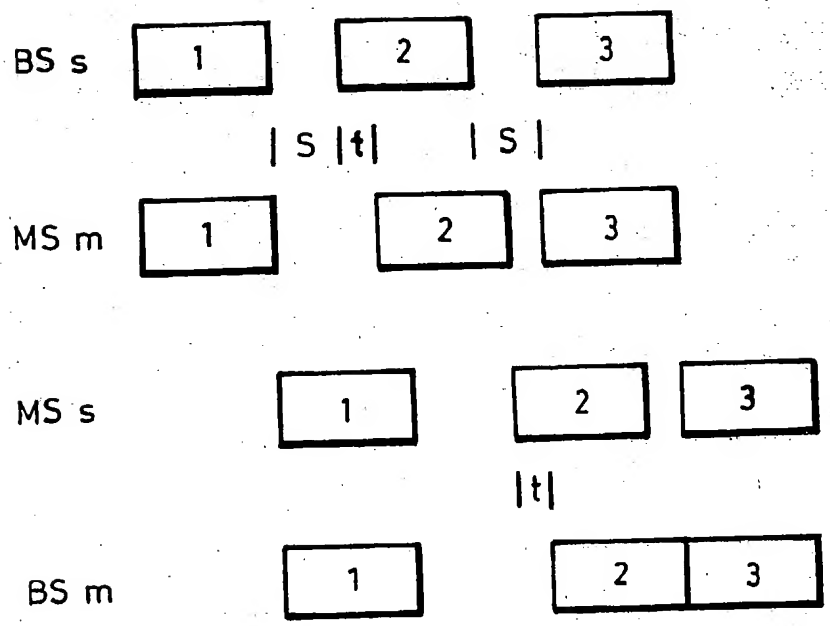
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Fig.1

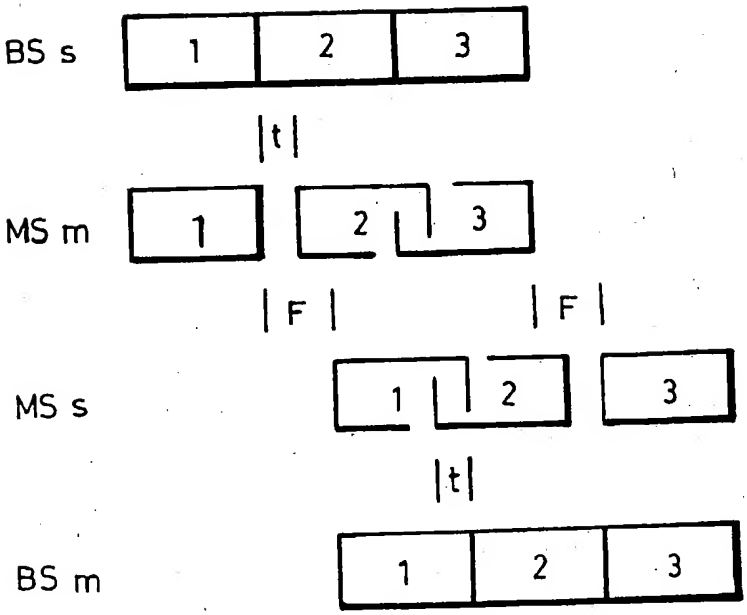
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Fig.2

European Patent Office

EUROPEAN SEARCH REPORT

Application number
EP8885071.5

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US-A- 3 529 243 (A. REINDL) *see column 1 line 72 - column 2 line 16*	1	H 04 Q 7/02 H 04 B 7/26
A	EP-A2- 171 525 (STANDARD ELEKTRIK LORENZ AG)	1	
A	EP-A1- 186 229 (PHILIPS PATENT-VERWALTUNGS GmbH		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

H 04 B
H 04 Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
STOCKHOLM	25-08-88	JONSSON B.

CATEGORY OF CITED DOCUMENTS

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